

REMARKS/ARGUMENTS

Applicants respectfully request reconsideration of this application in view of the present amendments and the following remarks. By this amendment, Claim 22 is added. As a result, upon entry of this amendment Claims 1-5, 8, 12, 17, 21 and 22 are pending in this case, with Claims 1 and 22 being independent claims. Because the application as originally filed contained 8 independent claims and 50 total claims (including multiple dependencies), and now contains only 2 independent claims and 22 total claims (including multiple dependencies and excluding non-elected claims), it is believed that no additional fees are due for the consideration of this paper. However, if additional fees are due, the Commissioner is authorized to charge such fees to deposit account number 13-2855. A copy of this paper is enclosed.

Claim Amendments

Claim 22 is added hereby reciting the limitations of Claims 1 and 2 in a single independent claim. Consequently, Applicants respectfully submit that no new matter is presented by the amendment, and respectfully request entry of the amendment.

Claim Rejections Under 35 U.S.C. § 103

Claims 1-5, 8, 12, 17 and 21 were rejected under 35 U.S.C. § 103(a) as being obvious over the admitted prior art of Figure 4 in view of Gorin (U.S. Patent No. 4,464,223), or in view of Okano et al. (JP 56-81678 A) and Gorin. Applicants respectfully submit that pending Claims 1-5, 8, 12, 17 and 21 and new independent claim 22 are not be properly rejectable over the applied references for the following reasons. Claim 1 recites an ion plating device having both an RF power unit and a bias power supply connected to the substrate holder, with the bias power supply unit outputting a bias voltage composed of a negative bias component having a predetermined negative voltage value for a predetermined output time and a pulse bias component corresponding to a pulse output having a positive voltage value for a predetermined time. Claim 22 recites the limitations of Claim 1 and further recites that the ratio of the predetermined time of the pulse bias to one cycle of the bias voltage being 40% or less. Applicants respectfully submit that the applied references do not disclose or suggest either a bias power supply outputting a negative bias component and a pulse bias component

with a positive voltage value as recited in both Claims 1 and 22, or a ratio of pulse bias time to bias voltage cycle time of 40% or less as recited in claim 22.

In an ion plating device according to the present invention, a substrate holder connected to a RF power supply is negatively biased due to its self-bias. If the bias power supply unit counteracts the self-bias and biases the substrate holder positively, a plasma generated in an evacuated chamber by power supplied from the RF power supply is attenuated and extinguished. To solve this problem, according to the present invention, a ratio of the predetermined time of the pulse bias to one cycle of the bias voltage is set to 40% or less, so that the bias power supply unit basically biases the substrate holder negatively like the self-bias. Thereby, positive charges captured by the substrate, for example, can be neutralized, and the attenuation of the plasma can be prevented as described in the specification at page 14, lines 23-25.

On the other hand, the admitted prior art of Fig. 4, Gorin and Okana et al. each disclose application of a constant DC bias voltage, if any. The admitted prior art, as conceded by the Examiner, teaches a DC bias power supply 67 applying a negative bias voltage only and, consequently, with no cycle frequency.

Gorin discloses that "[u]se of a DC power supply allows the amount of DC biasing induced by a plasma to be changed, independently of pressure or power" (column 3, lines 13-16) and "[t]he combination of two fields within the reaction volume causes maximum dissociation of the reaction gas as well as imparting a high ion energy to the ions within the plasma" (column 3, lines 38-43). Gorin further discloses a DC supply 42 as the bias supply and a low frequency AC power supply 36 as the power supply for generating the plasma, but does not disclose that the bias supply includes both positive and negative voltage components as recited in Claims 1 and 22. In each of the examples disclosed by Gorin, the bias voltage is either constant or non-existent (Example 1: DC bias = 100-150 volts; Example 2: no DC bias; Example 3: DC bias of up to 500 volts; Example 4: no DC bias). Gorin only discloses applying a constant, if any, bias voltage, and does not disclose or suggest any variation or cycling of the bias voltage, let alone providing both positive and negative components.

Furthermore, based on the fact that the low frequency AC power supply 36 and the DC supply 42 are connected to lower electrode 14, even if the low frequency AC power supply 36 and the DC supply 42 are assumed to operate as the bias supply in cooperation with each other, Gorin, in the first place, does not disclose as to which polarity, plus or minus, of a voltage the DC supply 42 generates. More specifically, Gorin does not disclose that the DC supply 42 generates a negative voltage. Even furthermore, Gorin does not disclose at all a voltage waveform, i.e., its polarity and positive voltage proportion per cycle, that is formed through superposing a low frequency voltage of the low frequency AC power supply 36 on a voltage of the DC supply 42. For each of these reasons, Gorin does not teach the bias power supply recited in Claims 1 and 22.

Okano et al. appear to teach the use of a variable DC source 22 in which the DC voltage is selected based on the material to be etched. However, Okano et al. also do not suggest cycling the DC voltage for the material to be etched, or providing both positive and negative components to the DC voltage. Because the applied references fail to disclose or suggest a bias voltage having both a negative component and a positive component, follows that the references neither anticipate nor render obvious Claims 1-5, 8, 12, 17, 21 and 22. Additionally, because the references do not disclose positive and negative components and cycles for bias voltages, the references necessarily cannot disclose a ratio of a pulse bias to a cycle time and, consequently, do not anticipate or render obvious claims 2 and 22 for this additional reason.

For at least the foregoing reasons, reconsideration and withdrawal of the rejection of the claims and allowance of the currently pending claims are respectfully requested. Should the Examiner wish to discuss the foregoing or any matter of form in an effort to advance this application towards allowance, she is urged to telephone the undersigned at the indicated number.

Dated: August 4, 2003

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